



Introduction on Yulong Snow Station of Cryosphere and Sustainable Development, Chinese Academy of Sciences

Pu Tao, Wang Shijin, Niu Hewen

Yulong Snow Mountain Station

State Key Laboratory of Cryospheric Sciences and Frozen Soil Engineering

Northwest Institute of Eco-Environment and Resources (NIEER)

Chinese Academy of Sciences (CAS)

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Yulong Snow Mountain Cryosphere and Sustainable Development National Field Science Observation and Research Station



Outline



1. Yulong Station

2. Observation of Yulong Station

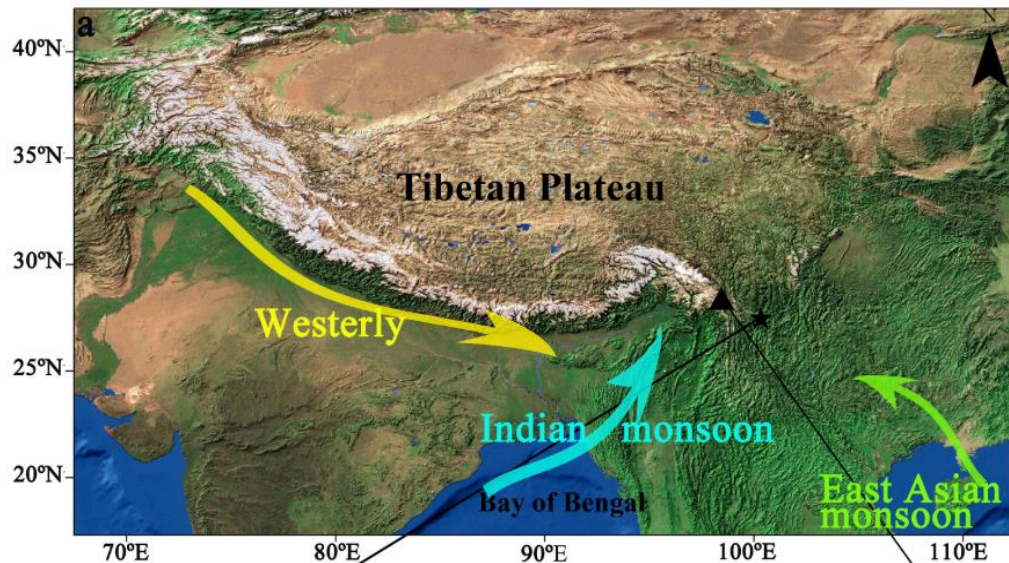
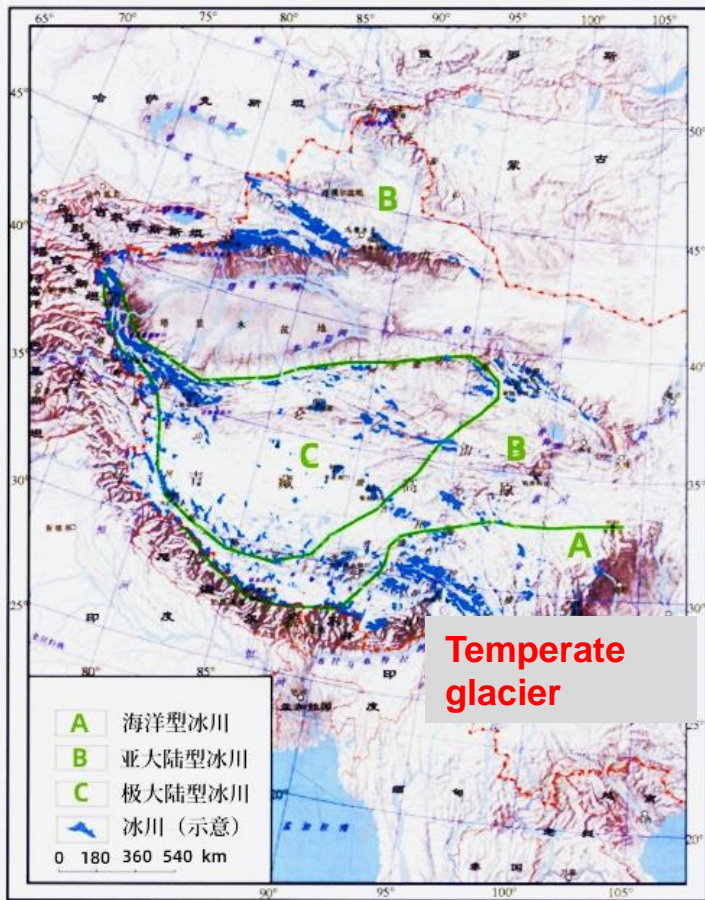
3. Major research progress

4. Cooperation

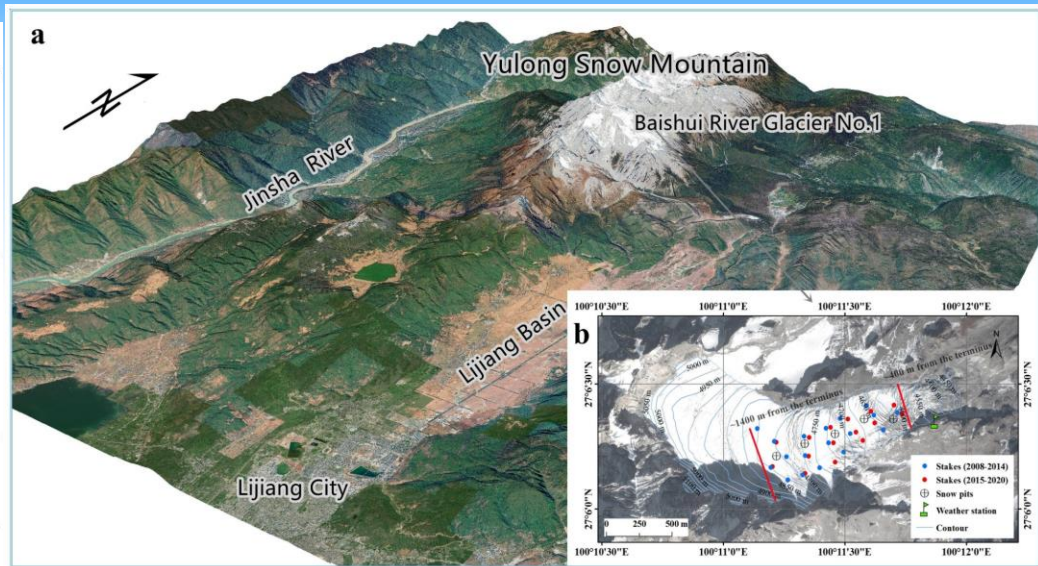
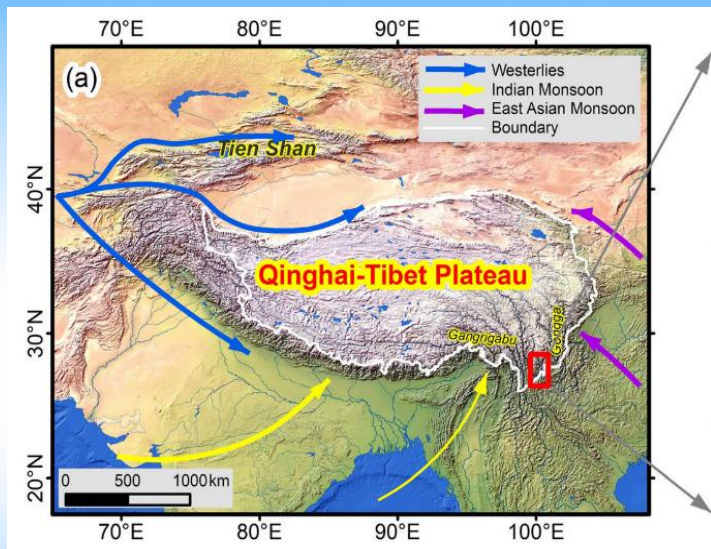
Location of Yulong mountain



- There are 8,607 temperate glaciers in China, covering an area of 13,203.2 km², accounting for 18.6% of the total glacier number and 22.2% of the total glacial area in China.
- The ice temperature of active layer is close to the melting point.



Introduction of Yulong mountain



The Yulong Snow Mountain ($26^{\circ}59' - 27^{\circ}17'N$, $100^{\circ}04' - 100^{\circ}15'E$), is the closest glacier area to the equator in Eurasia, the intersection area of east-west climate and southeast and southwest monsoon in China, the unique area of "sea-land-air" interaction, and the most representative area of the development of monsoonal temperate glacier in China.

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History of Yulong Station



1982

1999-2003

2006

2013

2019

2021

2022-2024

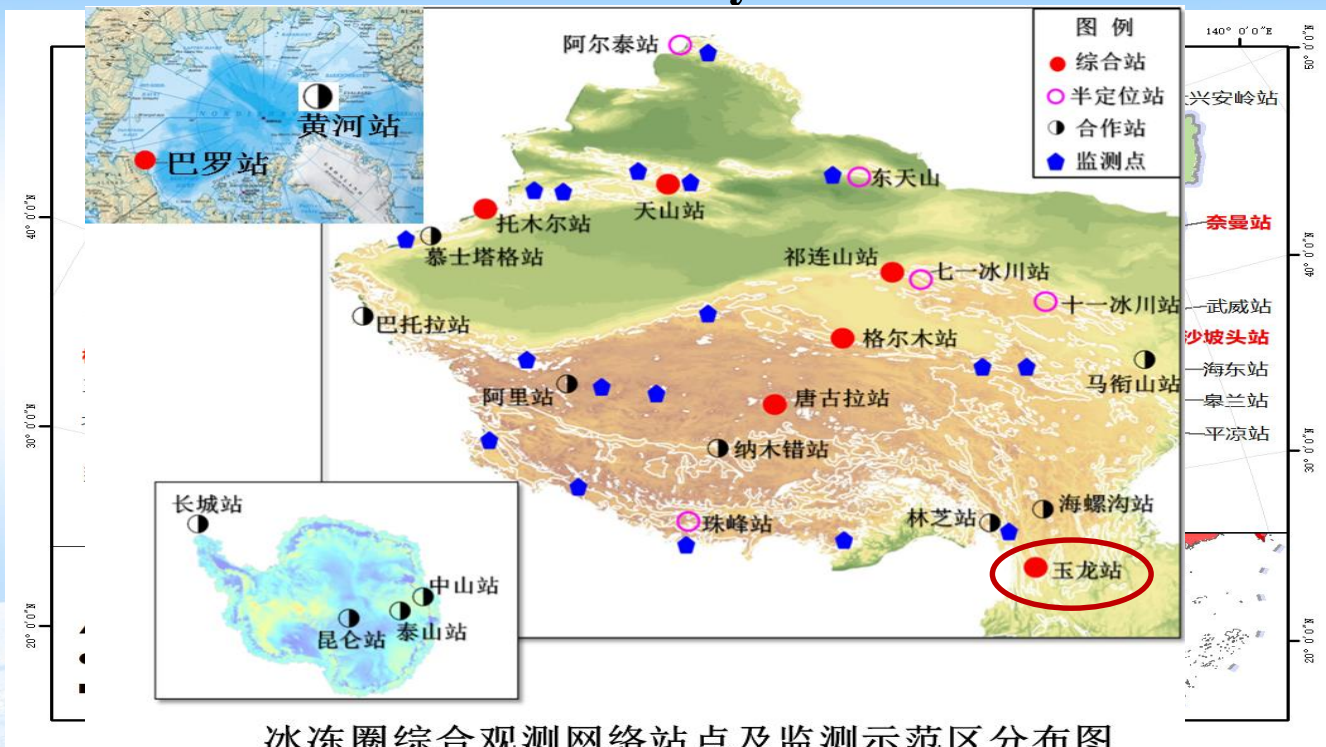
- ❑ During 1999 and 2006, Northwest Institute of Eco-Environment and Resources (NIEER), CAS prepared for the establishment of the Yulong Station
- ❑ **In 2006, the Yulong Station was established by NIEER and the management committee of the Yulong Provincial Tourism Development Zone in Lijiang, Yunnan Province**
- ❑ In 2013, Yulong Station was upgraded and incorporated into the management system of 'CAS Alpine Cold Network', which received direct guidance and support from the CAS
- ❑ In 2019, Yulong Station entered the sequence of academy level stations of the CAS
- ❑ **In 2021, Yulong Station has been promoted to national field observation and research station**

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Platforms

The NIEER has twenty-five field stations, among them nine are national key station, and sixteen as CAS or institute key station.



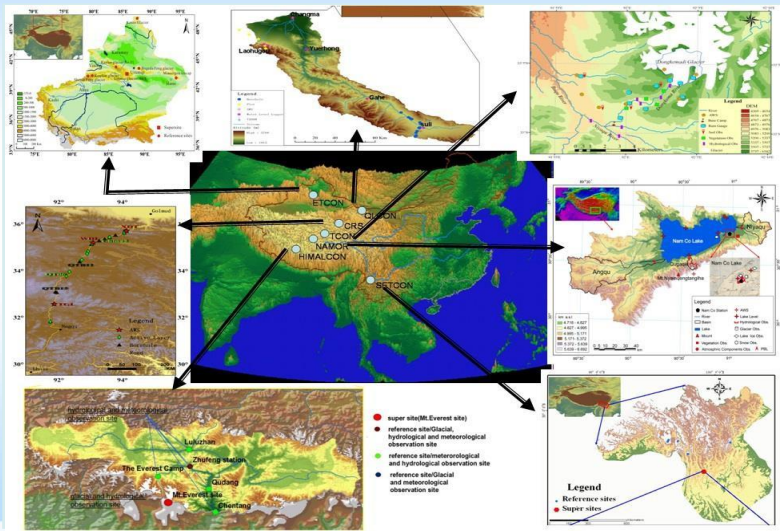
冰冻圈综合观测网络站点及监测示范区分布图

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Platforms



The State Key Laboratory of Cryospheric Sciences-led Chinese Cryosphere Observation Network is the reference for the Global Cryosphere Watch (GCW) programme initiated by the World Meteorological Organization





World Meteorological Organization
Organisation météorologique mondiale

Secretariat
7 bis, avenue de la Paix - Case postale 2300 - CH 1211 Genève 2 - Suisse
Tel.: +41 (0) 22 730 81 11 - Fax: +41 (0) 22 730 81 01
wmo@wmo.int - www.wmo.int

Weather • Climate • Water
Temp • Climat • Eau

WMO确认信

Our ref.: 8716-15/OBS/OSD/CryoNet
Annex: 1

Dr Zheng Guoguang
Permanent Representative of China
with WMO
China Meteorological Administration
46 Zhongguancun Nandajie, Haidian District
BEIJING 100081
China

GENEVA, 4 February 2015

Subject: Cryospheric observing sites identified for the pre-operational testing phase of CryoNet

Action required: Notify the WMO Secretariat of your decision about the proposed cryospheric observing sites as soon as possible, but preferably not later than **16 March 2015**

Cryospheric observing sites approved by WMO identified for the pre-operational testing phase:

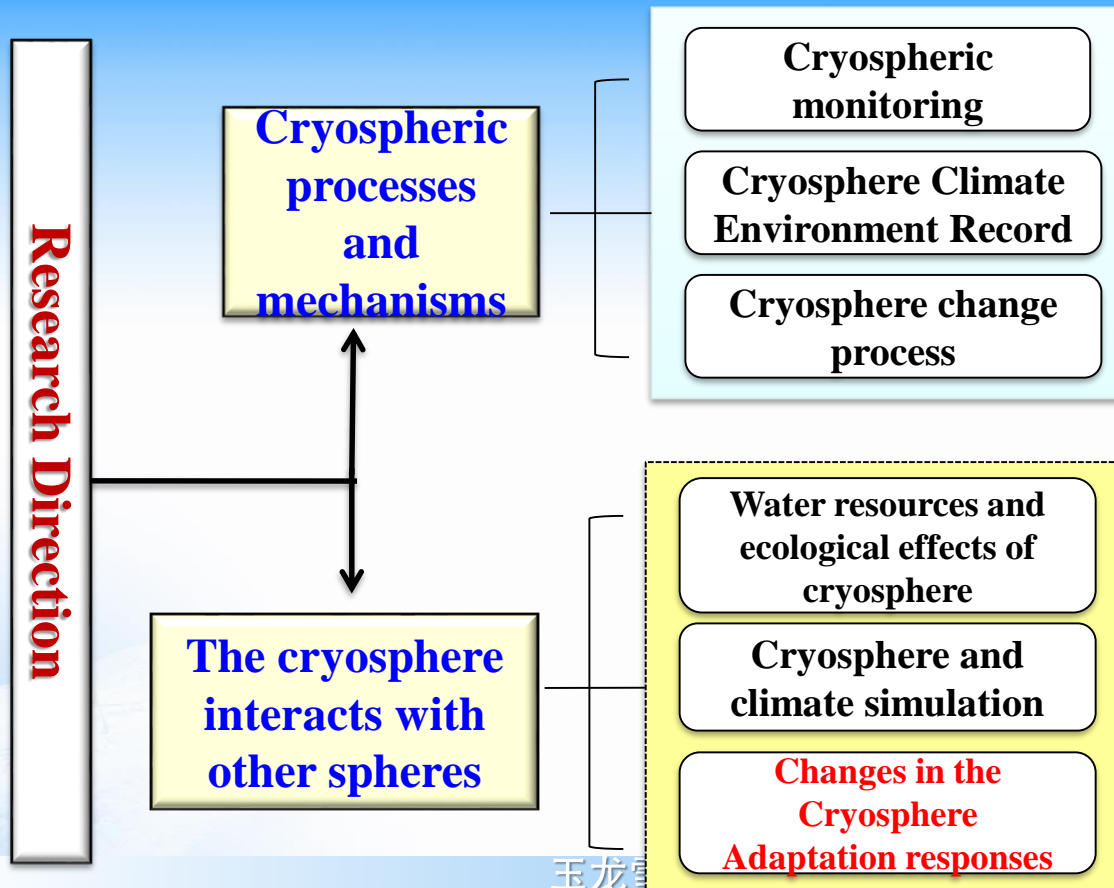
Site name	Qilianshan Station of Glaciology and Ecologic Environment
Manager name	zhangguoqiang.z.cao
Contact	zhaoshangnan@ibz.ac.cn
Institution	CAREERI, CAS
Site name	Qilian
Manager name	Chunfeng Han
Contact	hanchf@ibz.ac.cn
Institution	Chinese Academy of Sciences (CAS)
Site name	Tanggula Cryosphere and Environment Observation Station
Manager name	haoping.chao
Contact	haoping@ibz.ac.cn
Institution	CAREERI, CAS
Site name	Xidatan
Manager name	yingping.chao
Contact	yp@ibz.ac.cn
Institution	CAREERI, CAS
Site name	Tanggula
Manager name	Yongping Chao
Contact	yp@ibz.ac.cn
Institution	CAREERI, CAS
Site name	Flanshan
Manager name	zhonggen.lu
Contact	luzg@ibz.ac.cn
Institution	Cold and Arid Regions Environmental and Engineering Research Institute, CAS
Site name	The Koskar Glacier Camp (KGC)
Manager name	haoping.chao
Contact	haoping@ibz.ac.cn
Institution	State Key Laboratory of Cryospheric Sciences



for the Secretary General

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Overview of Yulong station





Outline



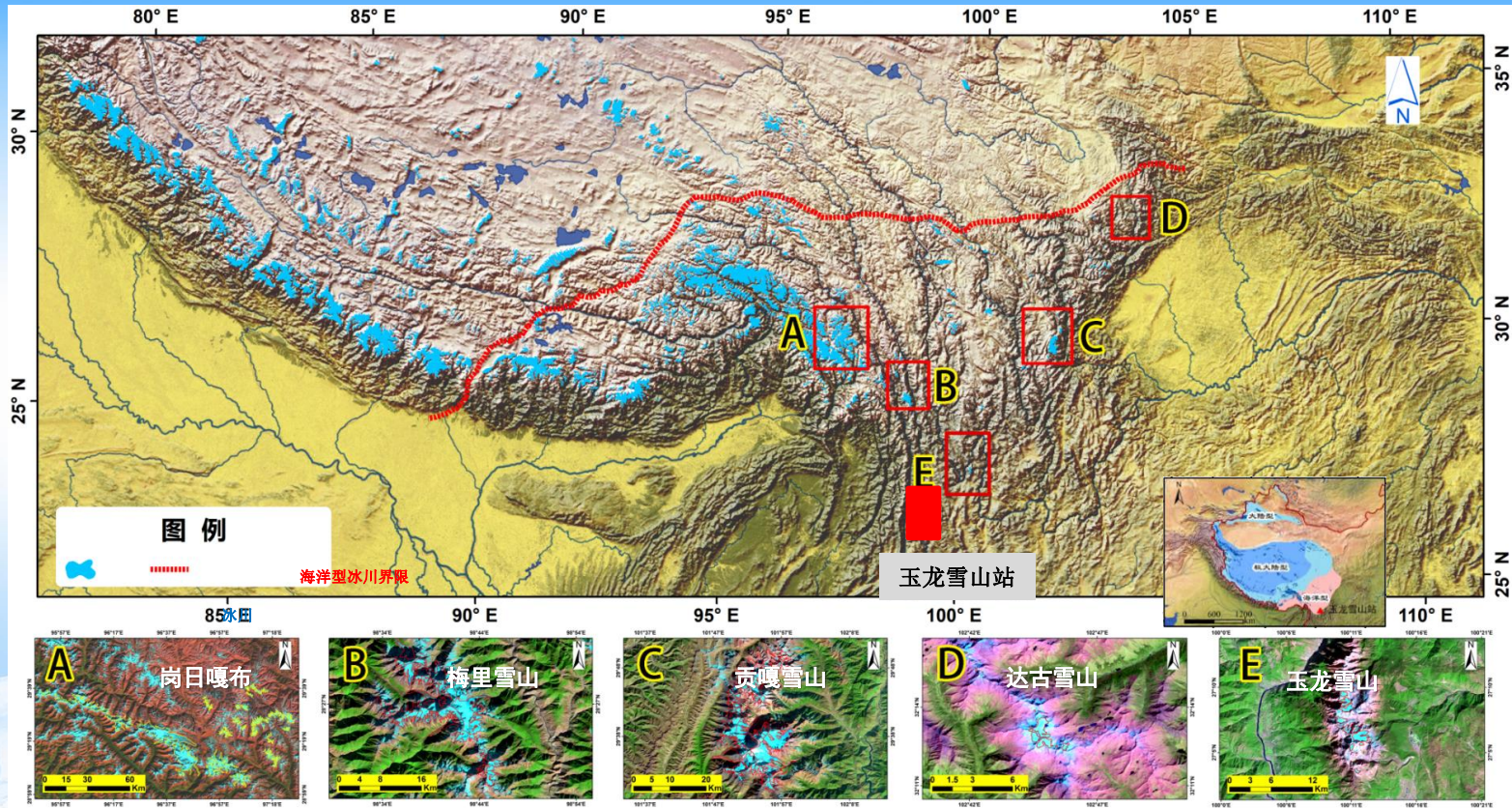
1. Yulong Station

2. Observation

3. Research progress

4. Cooperation

Observation



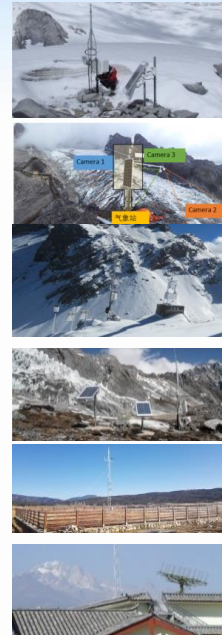
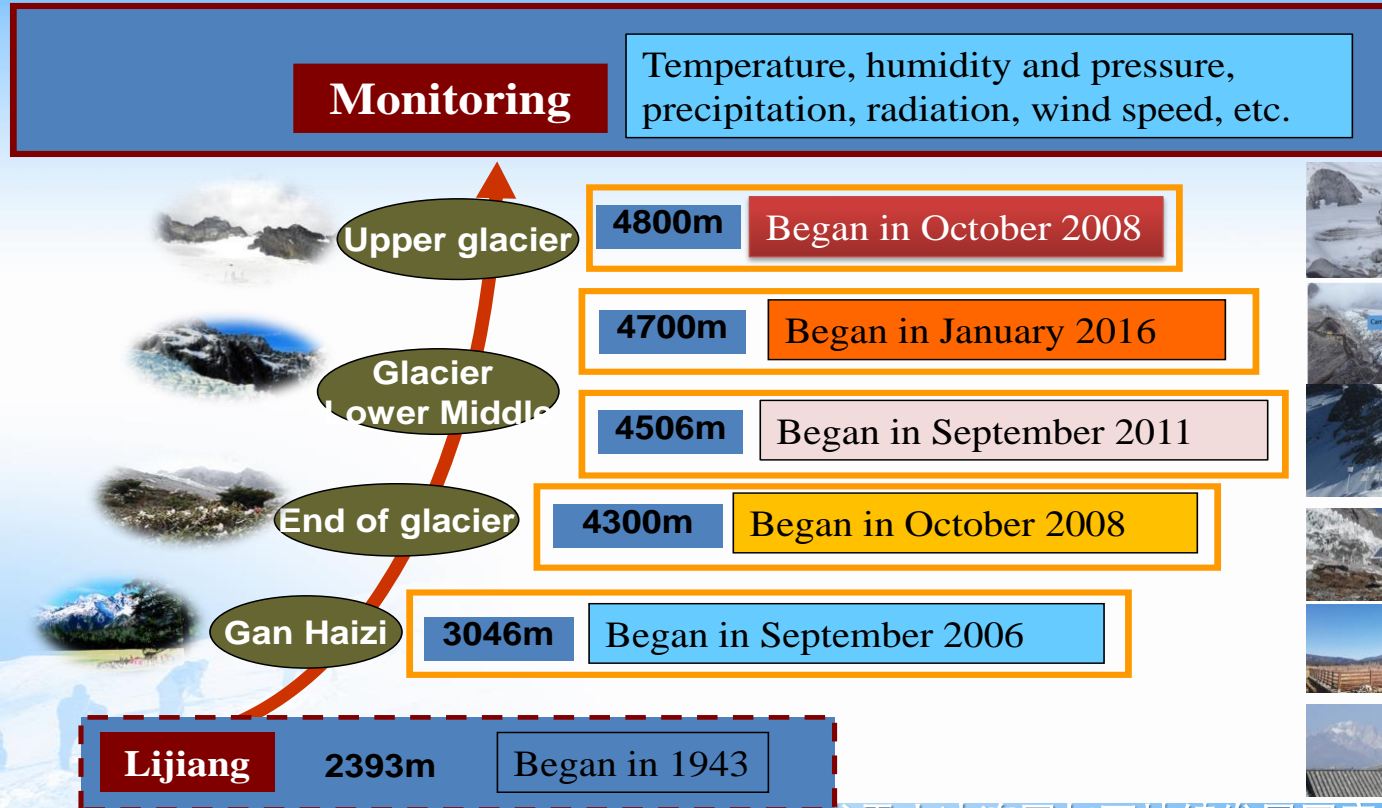
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Observation on climate



Vertical weather monitoring network at Yulong Snow Mountain



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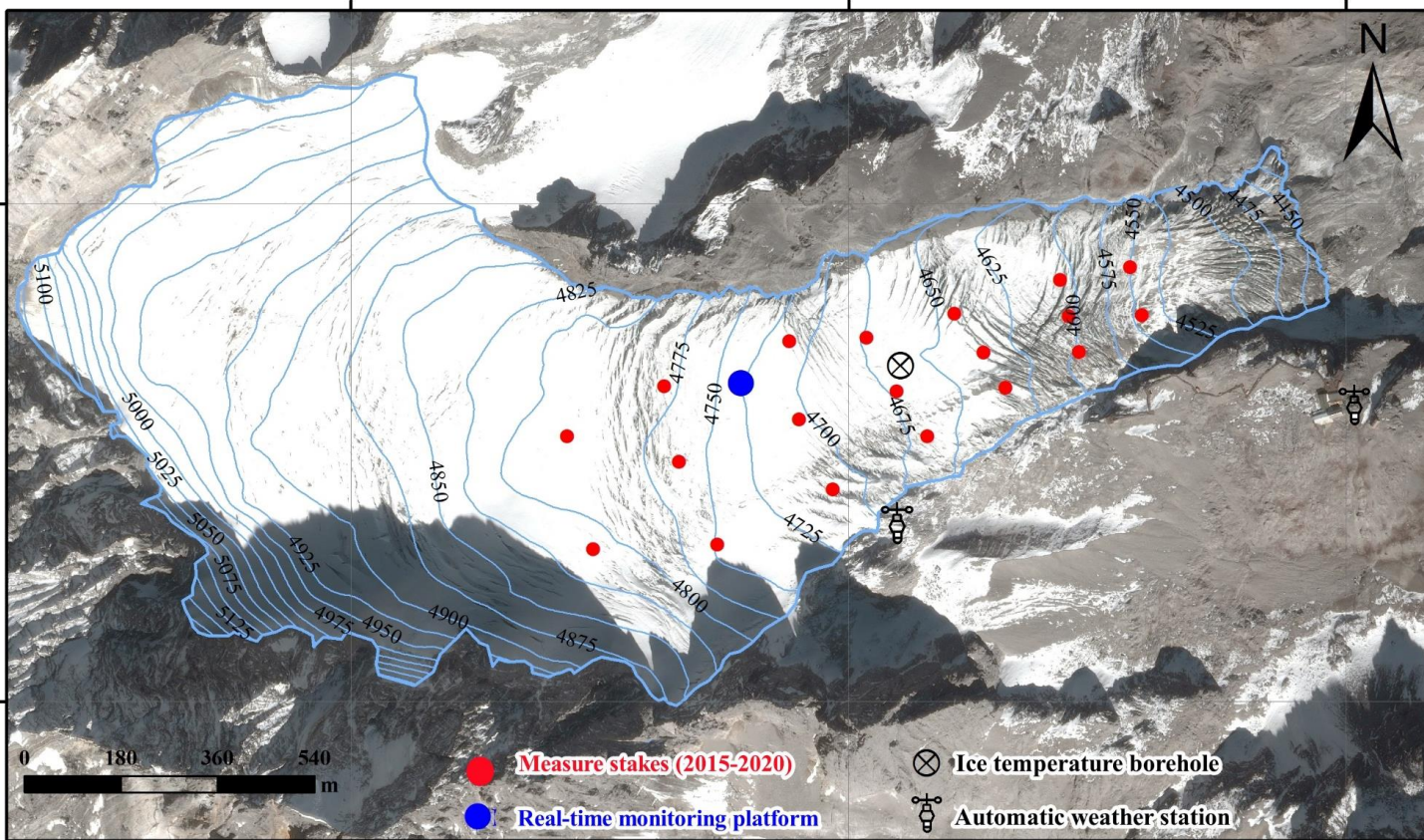
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Observation on glacier



Since 2006

- Mass balance
- Ice temperature
- Ice flow velocity
- Depth of snow pit
- Depth of snow cover
- Ice thickness
- Glacier boundary
- Glacier morphology
- Albedo
- Glacier digital elevation
- Real-time ice flow
- ..., etc.



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Observation - glacier

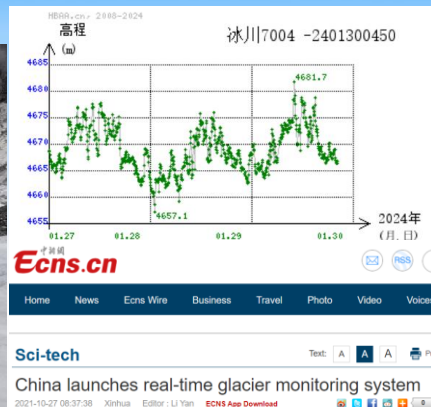


In 2021, the first real-time monitoring system for glaciers in China was established



HOME / NEWSROOM / CAS IN MEDIA

China Launches Real-time Glacier Monitoring System



A real-time glacier monitoring system has been officially put into use on a glacier in the Yulong Snow Mountain in southwest China's Yunnan Province, according to the Chinese Academy of Sciences (CAS).

The system, jointly developed by the Northwest Institute of Eco-Environment and Resources of the CAS and the Wuhan University Chinese Antarctic Center of Surveying and Mapping, is composed of modules that use the Global Navigation Satellite System (GNSS), laser distimeters, cameras, meteorology equipment, ice temperature testing equipment and seismographs.

Observation data is transmitted via the 4G network and released online. Since July 2021, the system has obtained information on glacial melting and accumulation, glacial velocity, ice quakes and temperature humidity pressure.

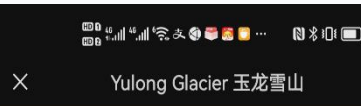
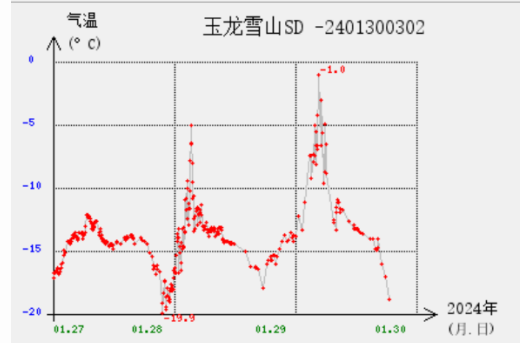
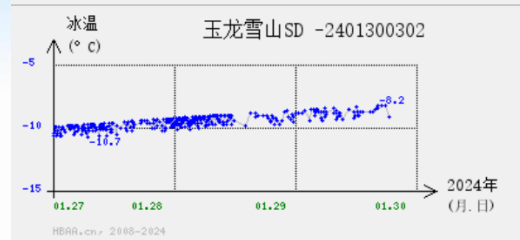
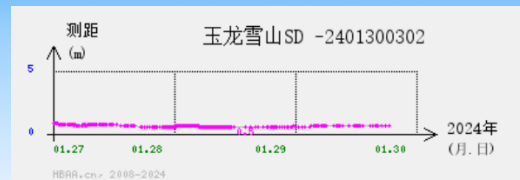
The system remarkably reduces the difficulty and potential risks of the artificial monitoring of high-altitude glaciers, and realizes the continuity and accuracy of data collection and the visualization of data transmissions.

The system's monitoring data is updated online every five minutes.



CHINA / SOCIETY

China launches 1st real-time glacier monitoring system in SW.China's Yunnan, 'expected to expand to Xizang (Tibet)'



Yulong Glacier 玉龙雪山

玉龙雪山冰川
Yulong Glacier



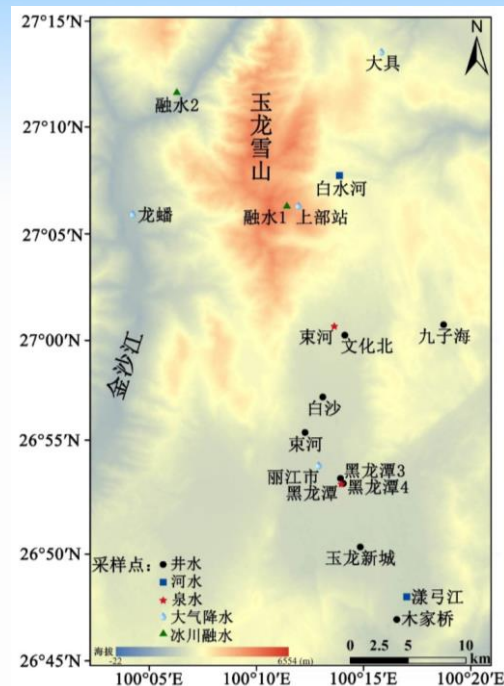
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Observation on hydrology



The hydrological effect of cryosphere change



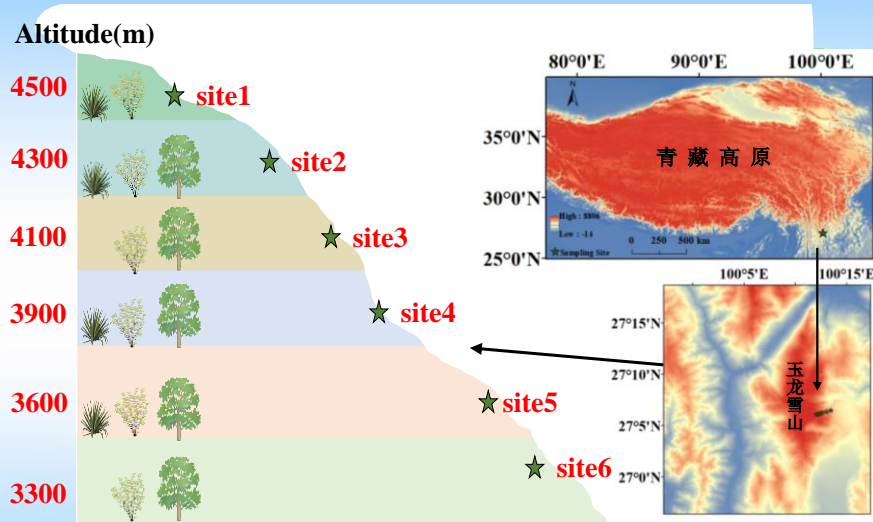
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Observation



The ecologic effect of climate and glacier change



Study the water source and water use efficiency of plants of different altitude of Mt.

Yulong using isotopes

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Observation

The atmospheric and water environment



Ions; stable isotopes; DOC; BC-OC; trace elements; Hg; Microplastic

科学观测研究站

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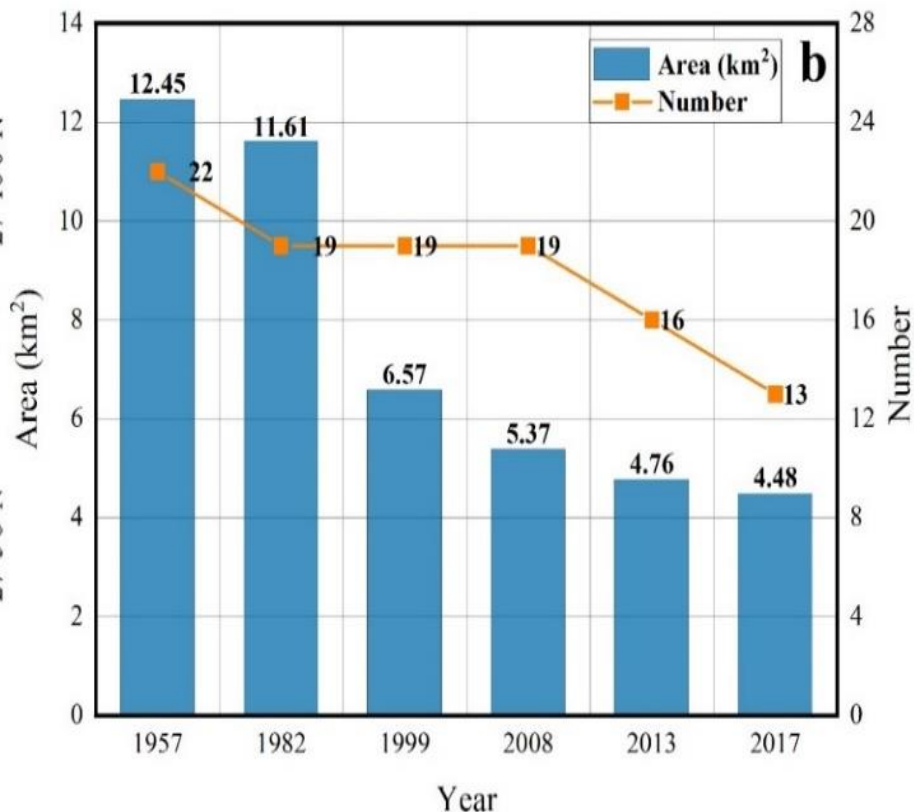
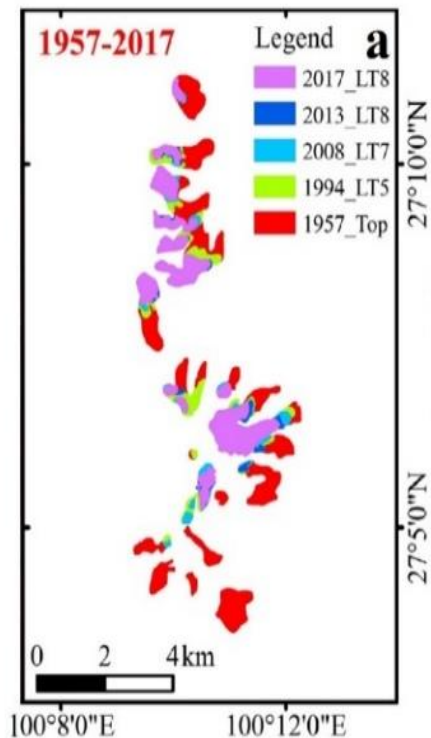


Outline



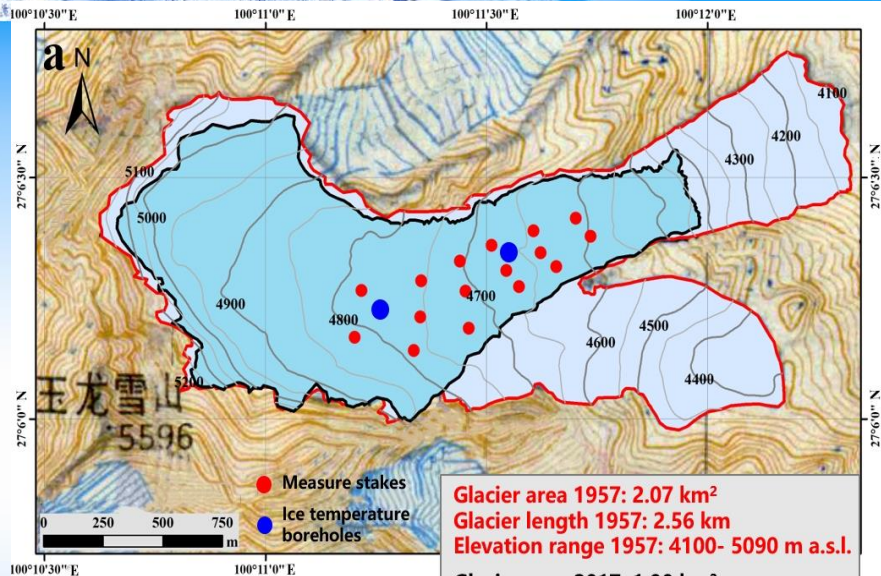
- 1. Yulong Station**
- 2. Observation system**
- 3. Major research progress**
- 4. Cooperation**

Glacier change

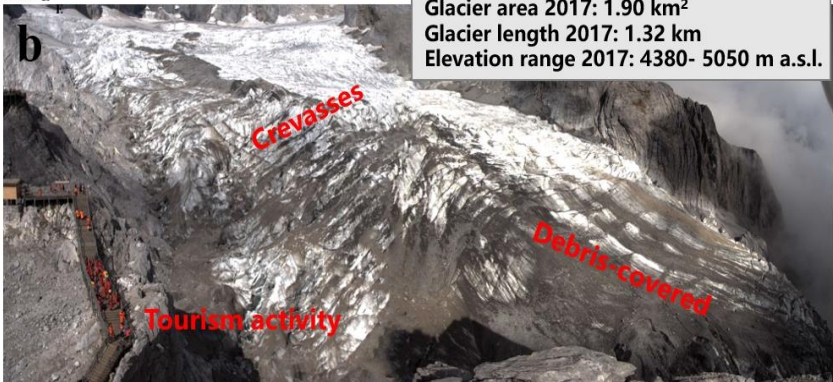


The glacial area fell by **64%** (from 12.45 km² in 1957 to 4.48 km² in 2017) and **9** glaciers (from a total of 22 glaciers in 1957 to 13 glaciers in 2017) disappeared from 1957 to 2017.

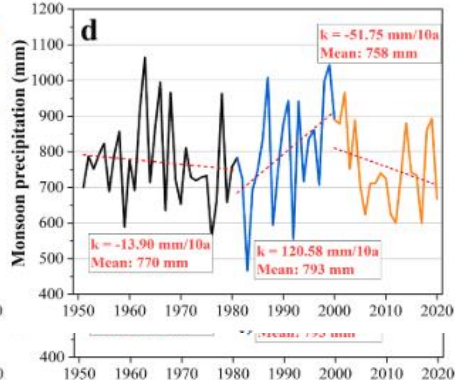
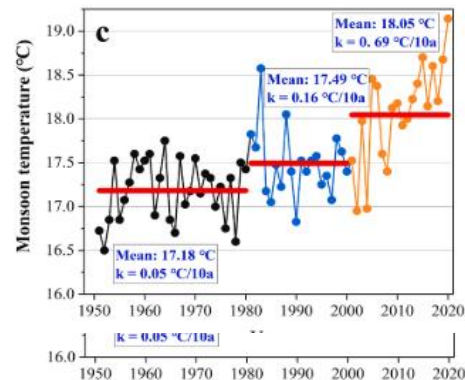
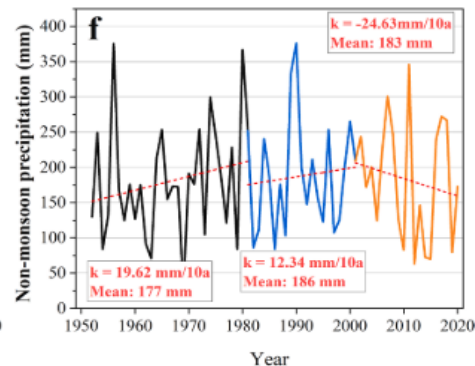
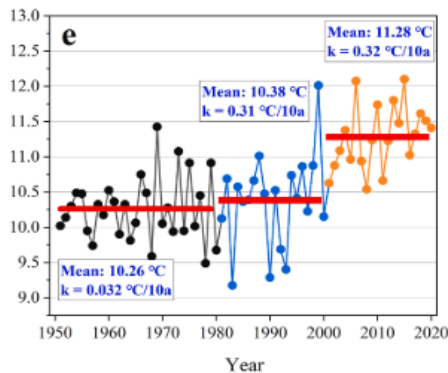
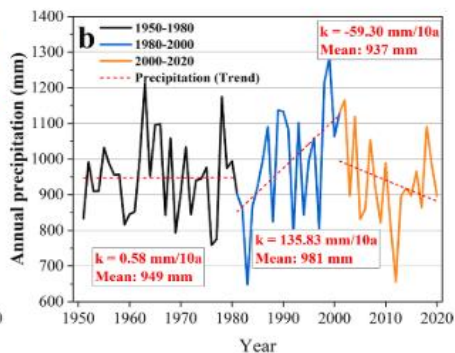
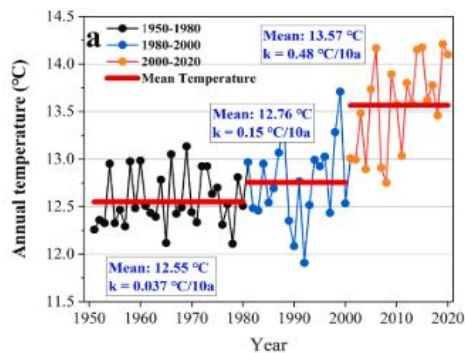
Baishui Glacier No.1 (BRG1)



The length and area change of Glacier No. 1

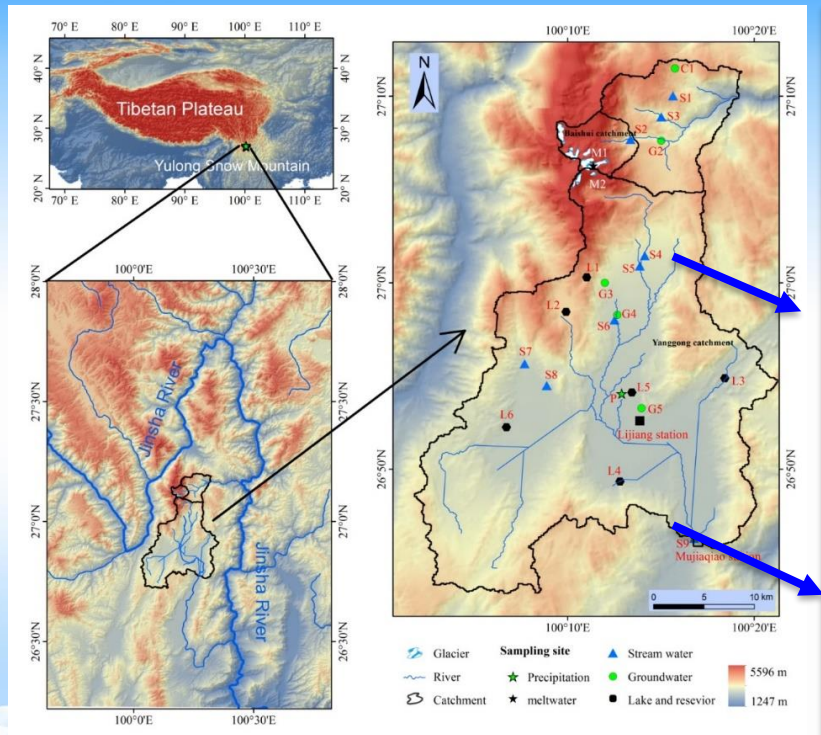


Climate change



Our analysis suggested that external temperature is the main driving force on glacier mass loss over interannual timescales, on the basis of little change in precipitation.

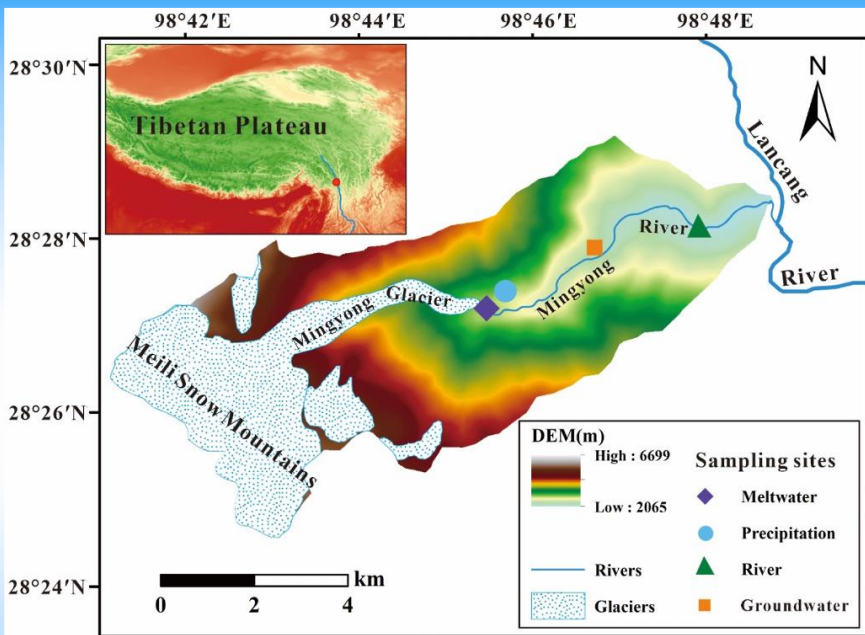
The contribution of meltwater to runoff



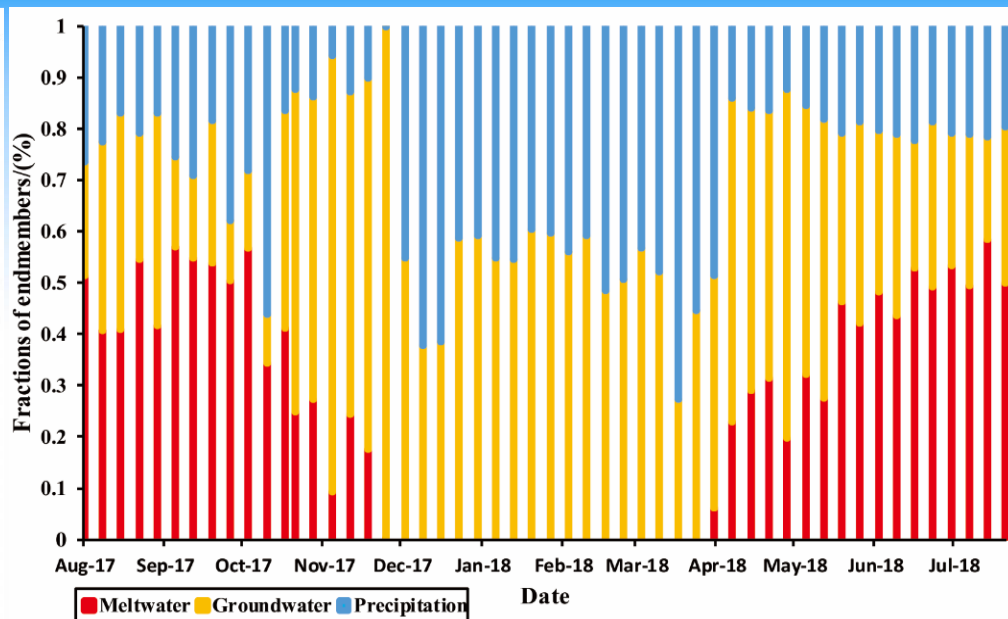
Catchment	Period	Proportion of meltwater (%)
Baishui	Pre-monsoon	38.3
	Monsoon	61.1
Yanggong	Pre-monsoon	47.9
	Monsoon	6.8

Hydrograph separation results for the Yanggong and Baishui catchments

The contribution of glacial to runoff



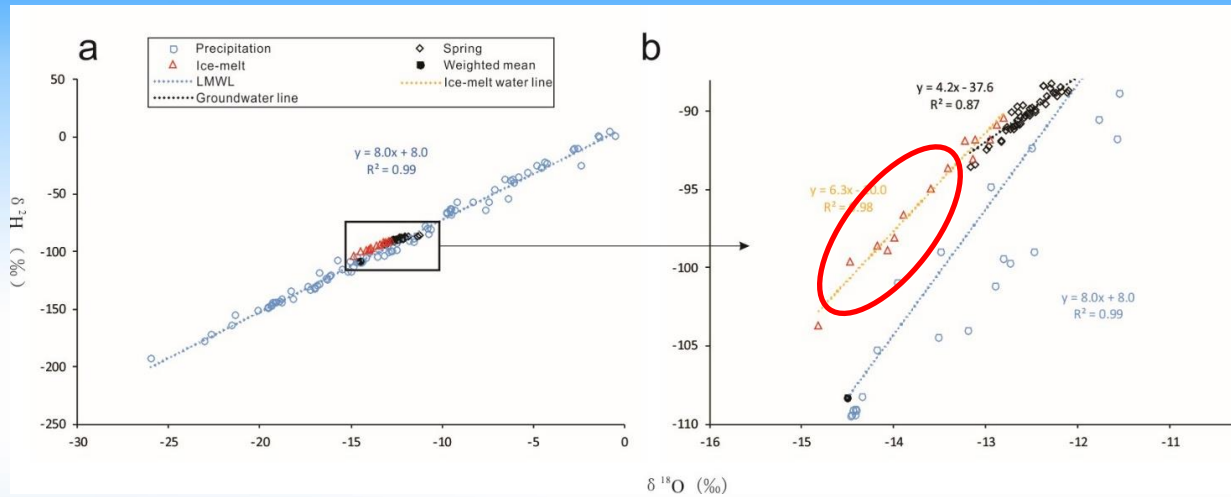
Location of Mingyong catchment



Hydrograph separation in Mingyong catchment

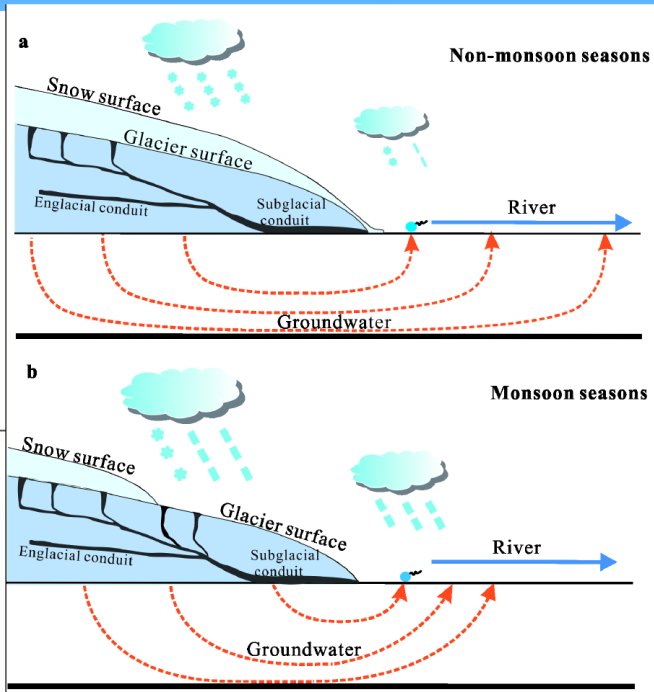
- ◆ The contribution of meltwater to runoff was 38% in a year
- ◆ The runoff components were more sensitive to temperature

The contribution of meltwater to groundwater



$\delta^{18}\text{O}$ - δD slope in different water from Mingyong basin, Mt. Meili

Ice - melt water, non-monsoon and monsoon precipitation contributions 46%, 41% and 13% to ground water, respectively.



Groundwater recharge in the nonmonsoon seasons (a) and monsoon seasons (b) in Mingyong catchments.

Cooperation



Since 2010, more than 10 international conferences or workshop are hosted and organized. 200 foreign scientists worked with Yulong station since 1999.



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Pro. Dorte Herzke, Sabine Eckhard, Vladimir Nikiforov, and Cleo Davie-Martin from Norwegian Meteorological Institute with the Second Sino-Norwegian Winterschool visited Yulong station in 2024



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Pro. Kim Johan Holmēn from Norwegian Polar Institute visited

Yulong station in 2023



International Forum on Biodiversity of the Ecological Society of China, Japan and Korea



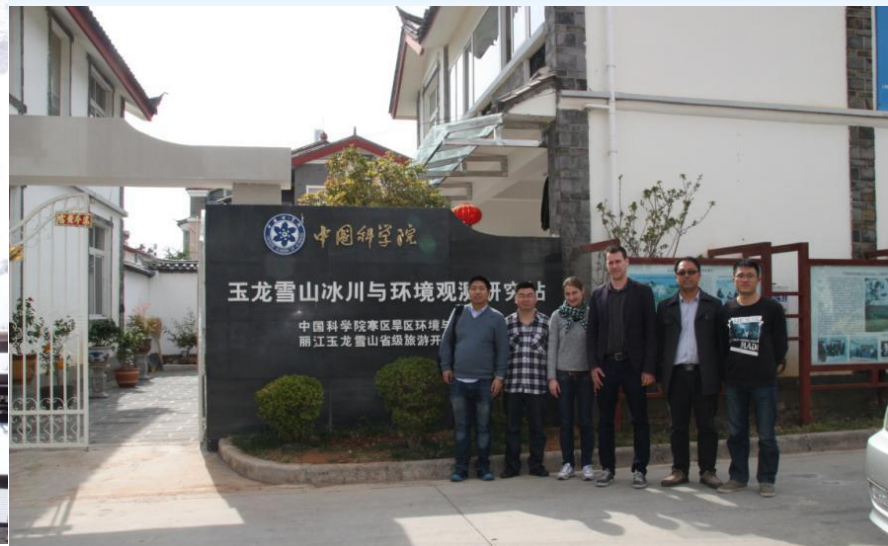
On 22 May 2010, the China-Japan-Korea Biodiversity Forum was successfully held in Lijiang, China from 22 to 25 May 2010, with the theme of "**Welcome COP-10, Talking about Diversity, Acting Together in Asia**". At Yulong Station, in-depth exchanges were held on cryosphere and alpine ecological change and conservation, while **future tripartite cooperation** between China, Japan and Korea on **cryosphere ecological services** was discussed.



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In October 2015, Andreas Gautz visited Yulong Station to learn more about the preliminary implementation plan and the design of the observation platform for the sub-project "**Automated monitoring of glacier changes in Yulong and its related analysis**" under the Sino-Swiss cooperation project "Integrated water resources and risk management in the Jinsha River Basin under climate change".

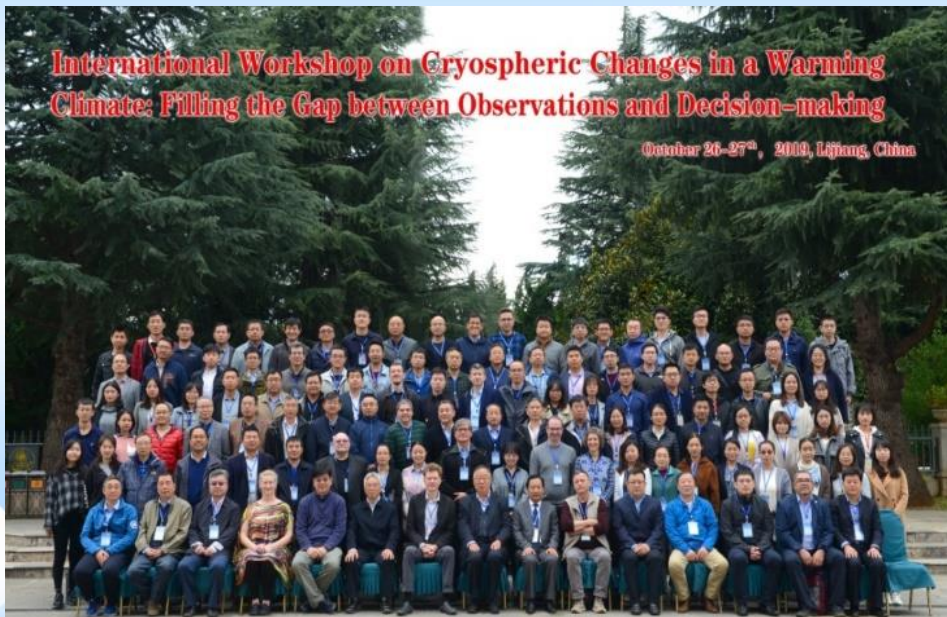


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“International Workshop on Cryospheric Changes in a Warming Climate: Filling the Gap between Observations and Decision-making” was held in Lijiang in 2019



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Thank you!

Welcome to our station!



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